

10804238

(12) UK Patent Application (19) GB (11) 2 319 265 (13) A

(43) Date of A Publication 20.05.1998

(21) Application No 9724301.8

(22) Date of Filing 18.11.1997

(30) Priority Data

(31) 9823924

(32) 18.11.1996

(33) GB

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E1 9YY, United Kingdom**(51) INT CL⁶**D04H 1/48**

(52) UK CL (Edition P)

D1R RGZ R151 R307 R308 R309 R310 R318 R319 R520**R541 R551 R562****U1S S1231**

(56) Documents Cited

GB 1408392 A**EP 0245017 A1****EP 0171807 A2****EP 0171806 A2****WO 93/22486 A1****US 4555430 A**

(58) Field of Search

UK CL (Edition P) D1R RBF RDD RFZ RGZ**INT CL⁶ D04H 1/44 1/46 1/48 1/54 3/10 5/02****Online: WPI**(54) **A high durability non-woven fabric**

(57) A non-woven fabric suitable for use as a household cleaning and polishing cloth of good absorbency, and high durability yet low pilling and lint comprises from 5 to 95% by weight of absorbent fibres and 5 to 95% by weight of bicomponent fibres, optionally further including non-absorbent fibres, said absorbent fibres and said bicomponent fibres being entangled with one another by an entanglement process to form a fibrous web and the fibres of the fibrous web being bonded to one another by a low melting point component of said bicomponent fibres which has been caused to melt by a heat treatment/drying process. The entanglement process may use water jets.

A HIGH DURABILITY NON-WOVEN FABRIC

The present invention relates to a high durability non-woven fabric and a method of forming the same. The high durability non-woven fabric of the present invention
5 is intended particularly, but not exclusively, for use as a household cleaning and polishing cloth.

A household cleaning and polishing cloth should exhibit some of the following features: rapid uptake of water which is necessary to mop up liquid spills; high
10 water and oil absorbency which is necessary for general purpose household cleaning; high resistance to general household cleaning preparations including detergents and polishes; high resistance to vegetable and animal oils and fats; durability to boil washing; and high resistance to
15 household cleaning preparations and bleaching agents to allow the cloth to be sanitised.

Presently available household cleaning and polishing cloths generally comprise stitched or woven cloths, sponges and chemically bonded non-woven fabrics. The
20 present invention is directed to providing an improved household cleaning and polishing cloth formed from a non-woven fabric.

It is known to manufacture non-woven fabrics by mechanical and/or chemical bonding processes, and also by
25 entanglement processes. The last mentioned processes subject loose fibres or filaments to a stream or streams of jetted fluid e.g. air streams (US-A-4 100 324) or using hydraulic fluids (US-A-3 485 706) to intermingle the fibres.

30 Chemically bonded non-woven fabrics generally have good wash durability and low pilling and the chemical bonding process affords the manufacture of non-woven fabrics over a relatively large weight range. However, these chemically bonded non-woven fabrics usually exhibit
35 low absorbency and poor resistance to solvents. Mechanically bonded non-woven fabrics generally exhibit good absorbency and dry and wet bulk but are normally limited to heavier weight fabrics which have reduced wiping edge and higher pilling and lint.

In recent times, some household cleaning and polishing cloths have been made from a non-woven fabric formed by a hydro-entanglement process which provides a fabric having good absorbency but such cloths often have a poor durability. Hydro-entanglement is a known technique mentioned for example in the patent literature including WO-A-96/2704, US-A-5 500 068 and also in US-A-5 334 446.

US-A-5 334 446 proposes an elastic non-woven fabric to be formed by a hydro-entanglement process, and having a composite structure wherein two fibrous webs have an elastomeric web interposed therebetween. Binders provided in the fibre web undergo a two stage heating process to provide a degree of thermally activated bonding in the fibrous web. The nature of the fibres described therein is such that the fabric is considered as non-absorbent, being intended to provide compliant, elastic materials for support bandages, diapers and personal hygiene products.

It is an object of the present invention to provide a non-woven fabric formed by an entanglement process which not only offers good absorbency but also exhibits enhanced durability.

According to one aspect of the present invention, there is provided a non-woven fabric comprising 5 to 95% by weight of absorbent fibres and 5 to 95% by weight of bicomponent fibres, said absorbent fibres and said bicomponent fibres being entangled with one another by an entanglement process to form a fibrous web and the fibres of the fibrous web being bonded to one another by a low melting point component of said bicomponent fibres which has been caused to melt by a heat treatment/drying process.

Preferably, the entanglement process is a hydro-entanglement process.

The non-woven fabric may also include from 5 to 95% by weight of non-absorbent fibres at the expense of some of the other fibre components. Preferably the non-woven fabric includes 20 to 40% by weight of non-absorbent

fibres. More preferably, the non-woven fabric comprises about 30% by weight of non-absorbent fibres. These fibres may be selected from polyesters and acrylics or combinations thereof.

5 In a preferred form the non-woven fabric may comprise from 40 to 80% by weight of absorbent fibres. The absorbent fibres may include fibres formed of one of cotton, pulp and viscose or a combination of fibres formed thereof.

10 A preferred range for the bicomponent fibres is from 5 to 15% by weight, more preferably such fibres are present at about 10% by weight.

Preferably, the bicomponent fibres are between 0.5 dtex and 6.6 dtex.

15 It is also preferred that the bicomponent fibres are between 25mm and 60mm in length.

Preferably, the low melting point component of the bicomponent fibres is activated at a temperature in the range of about 90°C to about 190°C, more preferably in the
20 range of about 90°C to about 145°C.

The bicomponent fibres may comprise fibres formed of one of polyamides, polyesters and polyolefins or a combination of fibres formed thereof.

In a particularly preferred form the non-woven fabric
25 comprises about 60% of absorbent fibres selected from the group consisting of cotton, viscose and mixtures thereof, about 30% of non-absorbent fibres selected from the group consisting of polyesters, and about 10% of bicomponent fibres selected from the group consisting of polyamides,
30 polyesters, polyolefins and a combination of fibres formed thereof.

According to a second aspect of the present invention, there is provided a method of forming a non-woven fabric, comprising the steps of: forming a mat of
35 fibres, said mat of fibres comprising 5 to 95% by weight of absorbent fibres and 5 to 95% by weight of bicomponent fibres; subjecting said mat of fibres to an entanglement

process to cause said fibres to become entangled with one another to form a fibrous web; and subjecting said fibrous web to a heat treatment/drying process to cause a low melting point component of said bicomponent fibres to melt
5 whereby said low melting point component bonds said fibres of the fibrous web together to form said non-woven fabric.

Preferably, the mat of fibres is formed by a carding process.

Preferably also, the entanglement process for forming
10 the fibrous web is a hydro-entanglement process.

The method may include forming a mat of fibres including 5 to 95% by weight of non-absorbent fibres in addition to the absorbent fibres and the bicomponent fibres.

15 The method also encompasses selection of the fibres according to the preferences stated hereinbefore.

The invention will now be further described by way of example in the following description of a preferred embodiment.

20 The non-woven fabric of the present invention is produced by firstly forming a dry laid mat of bicomponent fibres and absorbent fibres. The dry laid mat may also include non-absorbent fibres to effect wet bulk and resilience of the non-woven fabric being formed.
25 Preferably, the dry laid mat of fibres is formed by a carding process as described in GB-A-2151667. The mat of fibres thus formed is then lightly entangled using high pressure water jets in a hydro-entanglement process. The hydro-entanglement process causes the various fibres
30 forming the fibrous mat to become entangled with one another to form a fibrous web. Subsequent to this process, the fibrous web is subjected to a drying stage during which the low melting point component of the bicomponent fibres melts and adheres to the other fibre
35 components of the fibrous web to bond said fibres together. The other component of the bicomponent fibres, which is of a non-absorbent material, maintains its

structural integrity and forms part of the fibre construction of the non-woven fabric. The bicomponent fibres increase the cross-directional strength of the non-woven fabric. It has surprisingly been found that the inclusion of the bicomponent fibres does not reduce the absorbency of the non-woven fabric when compared with a non-woven fabric having generally the same fibre composition save for the inclusion of bicomponent fibres which after the drying stage comprise part of a non-absorbent fibre part of the non-woven fabric.

The preferred materials for forming the fibres of the fibrous web comprise natural and man-made water absorbent fibres such as cotton, pulp and viscose in addition to non-absorbent fibres formed of man-made synthetics such as polyesters and acrylics. The preferred materials for forming the bicomponent fibres are polyesters, polyamides and polyolefins and these fibres may be between 0.5 dtex and 6.6 dtex and have lengths between about 25mm and 60mm.

The percentage by weight of any of the absorbent, non-absorbent and bicomponent fibres may lie in the range of 5 to 95%, but preferably the percentage by weight of absorbent fibres lies in the range of 40 to 80%, the percentage by weight of non-absorbent fibre lies in the range of 15 to 40% and the percentage by weight of bicomponent fibres lies in the range of 5 to 10%. It is envisaged, however, that a non-woven fabric for forming an all round household cleaning and polishing cloth will comprise about 60% absorbent fibres (cotton or viscose), about 30% of non-absorbent fibres (polyester) and about 10% of bicomponent fibres. It is also envisaged that the weight of the non-woven fabric will be between 40g/m² and 200g/m², but it is preferred that the fabric weight will be between 45g/m² and 100g/m².

Table 1 below illustrates a subjective comparison of mechanically bonded and chemically bonded non-woven fabrics relative to the non-woven fabric of the invention.

Table 1

	Solvent Resistance (general household preparations)	Wash Resistance (boil)	Absorbency (wiping edge)
Non-woven fabric according to the invention	Very Good	Very Good	Very Good
Mechanically Bonded non-woven fabric	Very Good	Very Good	Good
Chemically Bonded non-woven fabric	Poor	Fair	Poor

As can be seen from Table 1, the non-woven fabric of the present invention provides a base fabric for forming household cleaning and polishing cloths which exhibits the advantages of both the mechanically and chemically bonded non-woven fabrics but without exhibiting their disadvantages. The non-woven fabric of the invention exhibits excellent resistance to household bleaching agents and to the 90/100°C wash cycle, a feature which has been the basis of consumer preference for traditional woven and stitched cloths in the past. By including a portion of bicomponent fibres in the mix of absorbent and non-absorbent fibres of non-woven fabric household cleaning and polishing cloths, no additional binding structures or fibres are required to strengthen the fabric which thus exhibits absorbency rates at least equal to the presently available non-woven fabric household cleaning and polishing cloths but with considerably enhanced durability and yet still exhibits low lint and low pilling.

Claims:

1 A non-woven fabric comprising 5 to 95% by weight
of absorbent fibres and 5 to 95% by weight of bicomponent
5 fibres, said absorbent fibres and said bicomponent fibres
being entangled with one another by an entanglement
process to form a fibrous web and the fibres of the
fibrous web being bonded to one another by a low melting
point component of said bicomponent fibres which has been
10 caused to melt by a heat treatment/drying process.

2 A non-woven fabric according to claim 1 wherein
the entanglement process is a hydro-entanglement process.

15 3 A non-woven fabric according to claim 1 or claim
2 wherein the non-woven fabric includes 5 to 95% by weight
of non-absorbent fibres.

4 A non-woven fabric according to claim 3 wherein
20 the non-woven fabric includes 15 to 40% by weight of non-
absorbent fibres.

5 A non-woven fabric according to claim 3 wherein
the non-woven fabric comprises about 30% by weight of non-
25 absorbent fibres.

6 A non-woven fabric according to any one of
claims 3 to 5 wherein the non-absorbent fibres comprise

fibres selected from the group consisting of polyesters, acrylics and a combination of fibres formed thereof.

7 A non-woven fabric according to any one of the
5 preceding claims wherein the non-woven fabric comprises 40
to 80% by weight of absorbent fibres.

8 A non-woven fabric according to any one of the
preceding claims wherein the absorbent fibres comprise
10 fibres selected from the group consisting of cotton, pulp,
viscose and a combination of fibres formed thereof.

9 A non-woven fabric according to any one of the
preceding claims wherein the non-woven fabric comprises 5
15 to 15% by weight of bicomponent fibres.

10 A non-woven fabric according to claim 9 wherein
the non-woven fabric comprises about 10% by weight of
bicomponent fibres.

20

11 A non-woven fabric according to any one of the
preceding claims wherein the bicomponent fibres are
between 0.5 dtex and 6.6 dtex.

25 12 A non-woven fabric according to any one of the
preceding claims wherein the bicomponent fibres are
between 25 mm and 60 mm in length.

13 A non-woven fabric according to claim 1 wherein the bicomponent fibres are fibres having a structural component of a non-absorbent material, and a low melting component selected from the group consisting of 5 polyamides, polyesters, polyolefins and a combination of fibres formed thereof.

14 A non-woven fabric according to claim 13 wherein the low melting point component of the bicomponent fibres 10 is activated at a temperature in the range of about 90°C to about 190°C.

15 A non-woven fabric according to claim 13 wherein the low melting point component of the bicomponent fibres 15 is activated at a temperature in the range of about 90°C to about 145°C.

16 A non-woven fabric according to any one of the preceding claims wherein the weight of the non-woven 20 fabric is in the range of from 40g/m² to 200g/m²,

17 A non-woven fabric according to claim 16 wherein the weight of the non-woven fabric is in the range of from 45g/m² and 100g/m².

25

18 A non-woven fabric according to claim 1 comprising about 60% of absorbent fibres selected from the group consisting of cotton, viscose and mixtures thereof,

about 30% of non-absorbent fibres selected from the group consisting of polyesters, and about 10% of bicomponent fibres selected from the group consisting of polyamides, polyesters, polyolefins and a combination of fibres formed
5 thereof.

19 A method of forming a non-woven fabric, comprising the steps of: forming a mat of fibres, said mat of fibres comprising 5 to 95% by weight of absorbent
10 fibres and 5 to 95% by weight of bicomponent fibres, said bicomponent fibres including a low-melting component; subjecting said mat of fibres to an entanglement process to cause said fibres to become entangled with one another to form a fibrous web; and subjecting said fibrous web to
15 a heat treatment/drying process to cause said low melting point component of said bicomponent fibres to melt whereby said low melting point component bonds said fibres of the fibrous web together to form said non-woven fabric.

20 20 A method according to claim 19 wherein the mat of fibres is formed by a carding process.

21 A method according to claim 19 or claim 20 wherein the entanglement process for forming the fibrous
25 web is a hydro-entanglement process.

22 A method according to any one of claims 19 to 20 wherein during forming the mat of fibres there is included

5 to 95% by weight of non-absorbent fibres in addition to the absorbent fibres and the bicomponent fibres.

23 A method of forming a non-woven fabric
5 comprising firstly forming a dry laid mat of bicomponent fibres having structural and low-melting components, and absorbent fibres in sufficient amounts to provide a desired absorbency, and sufficient amounts of non-absorbent fibres to obtain a desired wet bulk and
10 resilience in the non-woven fabric being formed, treating the dry laid mat of fibres using high pressure water jets in a hydro-entanglement process whereby the mat of fibres thus formed is then lightly entangled to form a fibrous web, and thereafter heating the fibrous web sufficiently
15 to cause the low melting point component of the bicomponent fibres to melt and adhere to the other fibre components of the fibrous web to bond said fibres together.

20 24 A method according to any one of claims 19 to 23 wherein the bicomponent fibres are thermally activated by heating at a temperature in the range of about 90°C to about 190°C.

25 25 A method according to claim 24 wherein the bicomponent fibres are thermally activated at a temperature in the range of about 90°C to about 145°C.

26 A non-woven fabric substantially or hereinbefore described.

27 A method of forming a non-woven fabric
5 substantially or hereinbefore described.



Application No: GB 9724301.8
Claims searched: 1-27

Examiner: Alex Littlejohn
Date of search: 5 March 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK CI (Ed.P): D1R (RBF, RDD, RFZ, RGZ)
Int CI (Ed.6): D04H 1/44, 1/46, 1/48, 1/54, 3/10, 5/02
Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB1408392	(ICI) see whole document, e.g. page 2 lines 54,55 and example	1,3-20,22
X	EP0245017A1	(Minnesota) see whole document, e.g. Examples 1-7	1,3-20,22
X	EP0171807A2	(Chicopee) see whole document, e.g. page 4 lines 6-21 and page 5 lines 4-7	1-25
X	EP0171806A2	(Chicopee) see whole document, e.g. page 6 line 25	1-25
X	WO93/22486A1	(BUSM) see whole document, e.g. page 6 lines 16-19	1,3-20,22
X	US4555430	(Mays) see whole document, e.g. col 2 lines 13-66	1-25

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.